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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,699	10/03/2003	Wen Chin Lin	24061.32	9863
42717	7590	06/14/2005	EXAMINER	
HAYNES AND BOONE, LLP 901 MAIN STREET, SUITE 3100 DALLAS, TX 75202			NGUYEN, DANG T	
			ART UNIT	PAPER NUMBER
			2824	

DATE MAILED: 06/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/678,699

Applicant(s)

LIN ET AL.

Examiner

Dang T. Nguyen

Art Unit

2824

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-17 and 27-32 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-10, 18 and 20-25 is/are rejected.
- 7) ☒ Claim(s) 4, 19 and 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: Search history.

Response to Amendment

1. This office action is in response to applicant's amendment received on 4/19/05. Claims 1, 18 and 19 have been amended. Claims 27-32 have been added. Claims 1-32 are pending on this application. Claims 1, 11, 18 and 27 are independent claims.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the figure 3 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

"None of figures show a third free layer and a third tunneling layer..."

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of

any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Gill,

Patent No. US 6,185,080 B1 – Date of Patent: Feb. 6, 2001.

Regarding independent claim 1, Fig. 11 of Gill discloses a magnetic tunnel junction (MTJ) configuration for use in a magnetic memory cell, the configuration comprising:

a pinned layer [220];

a first free layer [205];

a first tunneling barrier [210] (Col. 5 line 9) located between the pinned layer [220] and the first free layer [205];

a second free layer [235]; and

a second tunneling barrier [230] located between the pinned layer [220] and the second free layer [235].

4. **Claims 18 and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Ohtani, Pub. No.: US 2004/0052106 A1 – Pub. Date: Mar. 18, 2004.**

Regarding independent claim 18, Figs. 1- 6 of Ohtani disclose an integrated circuit comprising: an input/output section (Fig. 5 [IO and ZIO]); a plurality of logic circuit (Fig. 5 [34 and 35]) connected to the input/output section (Fig. 5 IO and ZIO)); and plurality of magnetic memory cells (Fig. 4 [1's]) connected to the logic circuits (Fig. 3 *disclosing memory array (including a plurality of magnetic memory cells) connected to Read/Write circuit which included logic circuits [34 and 35]*), the magnetic memory cells including a transistor and a storage structure (Fig. 1) including: a first magnetic junction device (Fig. 1 [13]) including a first free layer (Fig. 2 [18], a first tunneling barrier (Fig. 2 [17]), and a first pinned layer (Fig. 2 [16]); a second magnetic junction device (Fig. 1 [14]) including a second free layer (Fig. 2 [18], a second tunneling barrier (Fig. 2 [17]), and a second pinned layer (Fig. 2 [16]; and a first conductor (Fig. 6 [DL]) connected to configure the first [13] and second [14] magnetic junction devices in parallel (Fig. 6).

Regarding dependent claim 21, Figs. 2 and 6 disclose further comprising; a second conductor [DL] connects to the second free layer [18]; wherein the first conductor [DL] connects to the first free layer [18]; and wherein the first [13] and second [14] magnetic junction devices can be simultaneously written to using the second [DL] and first [DL] conductors respectively.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-3 and 5-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill, U.S. Patent No. 6,185,080 B1 - filed (03/29/99) in view of Chen, U.S. Patent No. 6,469,926 B1, filed (3/22/2000).

Regarding dependent claims 2-3 and 5-10, Gill as applied to claim 1 above disclosed every aspect of applicant's claimed invention except for the MTJ configuration wherein the first and second tunneling barrier have a different magneto-resistance, material, and processing recipe; the first and second free layers comprise a synthetic anti-ferromagnetic structure, and at least one of the free layers includes a single magnetic layer and a synthetic anti-ferromagnetic layer; and an antiferromagnetic layer, wherein the pinned layer is sandwiched between the first tunneling barrier and the antiferromagnetic layer.

Chen discloses wherein the first and second tunneling barrier have a different magneto-resistance (Abstract, lines 10-11);

the first and second free layers comprise a synthetic anti-ferromagnetic structure (Col. 2 lines 3-5 and 14-18 and Col. 9 lines 36-37);

further comprising: an anti-ferromagnetic layer [50], wherein the pinned layer [40] is sandwiched between the first tunneling barrier [38] and the anti-ferromagnetic layer [52].

the pinned layer is a synthetic anti-ferromagnetic layer (Col. 2 lines 14-15).

the first tunneling barrier is comprised of a different material than the second tunneling barrier (Col. 5 lines 11-16).

the first tunneling barrier is formed from a different material than the second tunneling barrier (Col. 5 lines 11-16).

at least one of the free layers includes a single magnetic layer (Col. 9 lines 13-14).

at least one of the free layers includes a synthetic anti-ferromagnetic layer (Col. 7 lines 38-39).

Gill and Chen are common subject matter for magnetic elements. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate all of magnetic element of Chen's MTJ configuration into Gill's MTJ configuration for the purpose of sensing information storage, fabricating and thus defining the magnetic element to improve the magnetoresistance ratio (Col. 1 lines 20-24).

6. Claims 20, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtani, Pub. No.: US 2004/0052106 A1 – Pub. Date: Mar. 18, 2004 in view of Chen, U.S. Patent No. 6,469,926 B1, filed (3/22/2000).

Regarding dependent claim 20, Fig. 2 of Ohtani discloses wherein the second magnetic junction device includes an ferromagnetic material [16] and wherein the first free layer [18] is connected to the ferromagnetic material [16] through the first conductor [DL]. However Ohtani fails to disclose the MTJ includes an anti-ferromagnetic material.

Fig. 3 of Chen discloses the second magnetic junction device includes an anti-ferromagnetic material [50] and wherein the first free layer [48] is connected to the anti-ferromagnetic material [50].

Ohtani and Chen are common subject matter for Magnetic Tunnel Junction. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporated Chen's anti-ferromagnetic material into Ohtani's MTJ for the purpose of fabricating the magnetic element with an improving magnetoresistance ratio (Col. 3 lines 5-6).

Regarding dependent claims 24 and 25, Ohtani as applied to claim 18 above disclosed every aspect of applicant's claimed invention except for the first tunneling barrier is comprised of a different material and formed from a different processing recipe than the second tunneling barrier.

Col. 5 lines 11-16 of Chen discloses tunneling barrier includes different materials and of course formed from a different processing recipe between first and second tunneling barrier.

Ohtani and Chen are common subject matter for Magnetic Tunnel Junction. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporated Chen's different material into Ohtani's tunneling barrier for the purpose of improving magnetic element with an improved magneto-resistance ratio.

7. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohtani, Pub. No.: US 2004/0052106 A1 – Pub. Date: Mar. 18, 2004 in view of Parkin et al., Patent No.: US 6,166948 – Date of Patent: Dec. 26, 2000.

Regarding dependent claim 22, Ohtani as applied to claim 18 above, discloses every aspect to applicant's claimed invention except for wherein at least one of the free layers includes a spacer sandwiched between two ferromagnetic layers.

Figure 3A of Parkin et al. discloses the free layer [10] includes a spacer [16] sandwiched between two ferromagnetic layers [12 and 14].

Ohtani and Parkin are analogous because both relating to Magnetic Tunnel Junction. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have incorporated Parkin's spacer into Ohtani's integrated circuit for the purpose of preventing the two ferromagnetic layers from being exchange-coupled to one another (Col. 6 lines 31-33).

Regarding dependent claim 23, Ohtani as applied to claim 18 above, discloses every aspect to applicant's claimed invention except for wherein the spacer comprises a synthetic anti-ferromagnetic material.

Col. 3 lines 31-32 disclose a spacer comprises a synthetic anti-ferromagnetic material (nonferromagnetic spacer).

Ohtani and Parkin are analogous because both relating to Magnetic Tunnel Junction. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have incorporated Parkin's spacer into Ohtani's integrated circuit for the purpose of preventing exchange coupling between the two ferromagnetic layers.

Allowable Subject Matter

8. Claims 4, 19 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

With respect to claim 4, the primary reason for indication of allowable subject matter is that the prior art fails to teach or suggest "wherein the second free layer is sandwiched between the second tunneling layer and the third tunneling layer".

With respect to claim 19, the primary reason for indication of allowable subject matter is that the prior art fails to teach or suggest "wherein a first magneto-resistance of the first magnetic junction device is different from a second magneto-resistance ratio of the second magnetic junction device".

With respect to claim 26, the primary reason for indication of allowable subject matter is that the prior art fails to teach or suggest "wherein a magneto-resistance ratio of the first tunneling barrier is 50-60% and a magneto-resistance ratio of the second tunneling barrier is 20-30%".

9. Claims 11 – 17 and 27 - 32 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

With regard to claims 11 and 27, the primary reason for indication of allowable subject matter is that the prior art fails to teach or suggest "wherein a first magneto-

resistance ratio of the first MTJ device is substantially different from a second magneto-resistance ratio of the second MTJ device”.

Response to Arguments

10. Applicant's arguments filed 4/13/05 with respect to claims 1-32 have been considered but are moot in view of the new ground(s) of rejection.

Prior art

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Shi	Pub. No.: US 2004/0191928 A1	Pub. Date: Sep. 30, 2004
Gider et al.	Pub. No.: US 2004/0066668 A1	Pub. Date: Apr. 8, 2004

Contact Information

12. Any inquiry concerning this communication from the examiner should be directed to Dang Nguyen, who can be reached by telephone at (571) 272-1955. Normal contact times are M-F, 8:00 AM - 4:30 PM.

Upon an unsuccessful attempt to contact the examiner, the examiner's supervisor, Richard Elms, may be reached at (571) 272-1869.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist, whose telephone number is (703)

305-3900. The faxed phone number for organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the Status of an application may be obtained from the patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or EBC@uspto.gov.

Dang Nguyen 06/08/2005



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